Description of the male of *Simulium (Gomphostilbia) binuanense* (Diptera: Simuliidae) from Palawan Island, Philippines

Hiroyuki TAKAOKA¹⁾, Victor F. TENEDERO²⁾ and Arlene G. BERTUSO³⁾

¹⁾ Department of Infectious Disease Control, Faculty of Medicine, Oita University,
Hasama, Yufu City, Oita, 879-5593 Japan

²⁾ West Ayala Condominium, 252 Sen. Gil Puyat Ave., Makati, Metro Manila, 1,200 Philippines

³⁾ Department of Parasitology, College of Public Health, University of the Philippines,
625 Pedro Gil Street, Ermita, Metro Manila, 1,000 Philippines

(Received: 24 March 2009; Accepted: 28 April 2009)

Abstract: The male of *Simulium (Gomphostilbia) binuanense* is described for the first time on the basis of males reared from pupae collected from the type locality of Palawan Island in the Philippines. The male of this species is very similar to *S. (G.) pegalanense* from Sabah, Malaysia but barely distinguished by the number of large upper-eye facets.

Key words: black fly, Simuliidae, Palawan, Philippines, taxonomy

The investigations on the pupae and larvae of black flies carried out in 2007 and 2008 in Palawan Island in the Philippines have added five more species [four new species of *Simulium (Gomphostilbia)* and one new record of *S. (Wallacellum)*] to the 16 reported species of simuliids in the island (Takaoka and Tenedero, 2007, 2008 a, b). In the subsequent survey in 2009 several pupae were collected from a small stream under the Binuan Bridge (the type locality of *S. (G.) binuanense*) and reared to adulthood. Among adults which had emerged, four females and six males were identified as *S. (G.) binuanense* based on the characteristics of the female and pupa noted by Takaoka and Tenedero (2008a).

In this paper, the male of this species is described for the first time.

The terms for morphological features used here follow those of Takaoka (2003). The male specimens of this species are deposited at the Department of Infectious Disease Control, Faculty of Medicine, Oita University, Oita, Japan.

Simulium (Gomphostilbia) binuanense Takaoka and Tenedero

Simulium (Gomphostilbia) binuanense Takaoka and Tenedero, 2008a: 1-7 (female and pupa).

DESCRIPTION. Male. Body length 2.5 mm. **Head.** Much wider than thorax. Upper eye consisting of 12 or 13 vertical columns and 12 or 13 horizontal rows of large facets. Face black, white pruinose. Clypeus black, moderately covered with yellow scale-like short to medium-long hairs (except median longitudinal portion widely bare) interspersed with several dark brown simple longer hairs near lower margin. Antenna composed of scape, pedicel and 9 flagellomeres, medium to dark brown except scape, pedicel, and base of 1st flagellomere whitish-yellow, and rest of 1st flagellomere yellow or light brown; 1st flagellomere elongate, 1.79 times as long as 2nd flagellomere. Maxillary palp with 5 segments, dark brown; proportional lengths of 3rd, 4th, and 5th segments 1.00 : 1.08 : 2.64; segment 3 of moderate size (Fig. 1A); sensory vesicle (Fig. 1A) nearly globular, small, 0.22 times as long as 3rd segment and with small opening. **Thorax.** Scutum

Fig. 1. Male of *Simulium* (*Gomphostilbia*) *binuanense*. A, 3rd segment of maxillary palp with sensory vesicle (left side and front view); B, hind basitarsus and 2nd tarsomere (left side and outer view); C, coxites, styles, ventral plate and median sclerite *in situ* (ventral view); D and E, styles (right side; D, ventrolateral view; E, medial view); F, ventral plate and median sclerite *in situ* (lateral view); G, ventral plate (end view); H, paramere (right side and dorsal view); I, parameres and aedeagal membrane (end view); J and K, 10th abdominal segments and cerci (right half; J, lateral view; K, end view). Scale bars. 0.05 mm for B; 0.02 mm for A and C-K.

black, with whitish-gray pruinose pattern composed of anterolateral triangular spot on each shoulder, and wide transverse band on pre-scutellar area, which is connected to anterolateral spots through wide band along each lateral margin; these pruinose areas shiny when viewed at certain angle of light; scutum

moderately covered with brassy short hairs; scutellum black, with brassy short hairs and dark brown long upright hairs along posterior margin. Postnotum brownish-black to black, and bare. Pleural membrane bare. Katepisternum brownish-black, longer than deep, moderately covered with brassy short hairs.

Legs. Foreleg: coxa and trochanter dark yellow; femur medium brown except apical cap dark brown; tibia dark brown except median outer portion light brown; tibia white sheeny extensively on outer surface when illuminated at certain angle of light, and moderately covered with white hairs on outer surface; tarsus black, with moderate dorsal hair crest; basitarsus moderately dilated, 5.87–6.27 times as long as its greatest width. Midleg: coxa dark brown with posterolateral surface brownish-black; trochanter light brown except basal 1/2 yellow; femur medium brown except apical cap brownish-black; tibia medium brown to brownish-black with extreme base dark yellow to light brown; tarsus dark brown except basal 1/2 of basitarsus dark yellow. Hind leg: coxa medium to dark brown; trochanter yellow; femur dark brown to brownish-black with base yellow; tibia brownish-black with extreme base dark yellow to light brown; tarsus dark brown except basal 3/5 of basitarsus and basal 1/2 of 2nd tarsomere yellowish-white though base of basitarsus dark brown; basitarsus (Fig. 1B) narrow, nearly parallel-sided, 5.70–5.80 times as long as wide, and 0.55–0.56 and 0.61 times as wide as greatest widths of tibia and femur; calcipala as long as width at base, and 0.43 times as wide as greatest width of basitarsus.

Wing. Length 1.5 mm. Costa with dark spinules and hairs. Subcosta bare. Hair tuft on stem vein dark brown. Basal portion of radius fully haired; R_1 with dark spinules and hairs; R_2 with hairs only. Basal cell absent. **Abdomen.** Basal scale dark brown, with fringe of dark brown hairs. Dorsal surface of abdomen medium brown to brownish-black except basal 1/2 of 2nd segment pale, and covered with dark short to long hairs; segments 2 and 5–7 each with whitish-gray pruinose dorsolateral large patches, of which those on segment 2 broadly connected in middle to each other, and those on segments 5–7 narrowly connected to each other along anterior margin; all these patches shiny when viewed at certain angle of light; segments 3 and 4 each also with pair of whitish-gray pruinose dorsolateral small patches along anterior margin, and segments 8 and 9 each with pair of similar lateral patches; sternites 3–8 shiny when viewed at certain

angle of light. **Genitalia.** Coxite in ventral view (Fig. 1C) nearly rectangular, 1.60 times as long as its greatest width. Style in ventral view (Fig. 1C) slender, tapered toward apex, 0.84 times as long as coxite, gently bent inward, with apical spine; style in ventrolateral view (Fig. 1D) nearly parallel-sided from base to basal 1/3, slightly narrowed and nearly parallel-sided from middle to near apex, and with truncate apex; style in medial view (Fig. 1E) curved inward, tapered from base toward apex. Ventral plate in ventral view (Fig. 1C), transverse, much wider than long, nearly parallel-sided, with anterior margin produced anteromedially, with posterior margin concave medially, and densely covered with microsetae on ventral surface; basal arms of moderate length, directed forward, nearly parallel-sided; ventral plate in lateral view (Fig. 1F) slightly produced ventrally; ventral plate in end view (Fig. 1G) rounded ventrally, and densely covered with microsetae on posterior surface. Median sclerite (Fig. 1C, F) wide, plate-like, connected to ventral plate medially. Paramere (Fig. 1H, I) of moderate size, each with 3 or 4 distinct hooks. Aedeagal membrane (Fig. 1I) moderately setose, not forming dorsal plate. Ventral surface of 10th abdominal segment thinly sclerotized anteriorly, without distinct hairs near posterior margin on each side. Cercus (Fig. 1J, K) rounded, encircled with 13–17 hairs.

SPECIMENS EXAMINED. Six males reared from pupae collected from a slow-flowing lowland stream (width 2 m, stream bed sand, water temperature 26°C, exposed to sun, altitude 40 m) just downstream of the Binuan Bridge at the point where the main road from Puerto Princesa to Brooks Point branches off to Montible, 25. II. 2009, by H. Takaoka.

REMARKS. The assignment of this species to the species-group, either the *batoense* species-group or the *ceylonicum* species-group, within the subgenus *Gomphostilbia* remained undetermined because the male was not available (Takaoka and Tenedero, 2008a). The males of this species examined in this study have a

slender hind basitarsus (Fig. 1B), revealing that *S. (G.) binuanense* can be reliably placed in the *batoense* species-group.

The male of *S. (G.) binuanense* is similar to that of *S. (G.) pegalanense* Smart and Clifford, described from Sabah, Malaysia (Smart and Clifford, 1969) in several features including the color of the legs, but is easily distinguished from the latter by the number of enlarged upper-eye facets (i.e., 12 or 13 in vertical columns and 12 or 13 horizontal rows in this species vs. 15 or 16 vertical columns and 15 horizontal rows in *S. (G.) pegalanense* according to the examination of the type slide-mounted specimen loaned from the Natural History Museum, London).

The males of *S. (G.) babuyanense* Takaoka and Tenedero and *S. (G.) mangasepi* Takaoka, both endemic to Palawan (Takaoka and Tenedero, 2007), are similar to the male of this species in the leg color. However, *S. (G.) babuyanense* differs by the large upper-eye facets in 14 vertical columns and 14 horizontal rows and the scutum which is whitish-gray pruinose except the non-pruinose median vitta and submedian round spots; *S. (G.) mangasepi* differs by the scutum covered with whitish-yellow short hairs and the ventral plate which has a nearly straight posterior margin when viewed ventrally.

ACKNOWLEDGEMENTS

We are grateful to Prof. Lilian A. de las Llagas, University of the Philippines Manila, for her support of this study. This study was financially supported by a Grant-in-Aid for Oversea Research from the Japan Society for the Promotion of Science (No. 18406011).

REFERENCES

- Smart, J. and Clifford, E. A. 1969. Simuliidae (Diptera) of Sabah (British North Borneo). *Zool. J. Linn. Soc.*, 48: 9–47.
- Takaoka, H. 2003. The Black Flies (Diptera: Simuliidae) of Sulawesi, Maluku and Irian Jaya. xxii+581 pp., Kyushu University Press, Fukuoka.
- Takaoka, H. and Tenedero, V. F. 2007. Two new and one newly recorded species of *Simulium* (Diptera: Simuliidae) from Palawan Island, the Philippines. *Med. Entomol. Zool.*, 58: 207–228.
- Takaoka, H. and Tenedero, V. F. 2008a. A new species of *Simulium* (*Gomphostilbia*) (Diptera: Simuliidae) from Palawan Island, the Philippines. *Med. Entomol. Zool.*, 59: 1–7.
- Takaoka, H. and Tenedero, V. F. 2008b. *Simulium* (*Gomphostilbia*) *rarum* sp. nov., a new species of black fly (Diptera: Simuliidae) from Palawan Island, the Philippines. *Med. Entomol. Zool.*, 59: 319–324.